full economies of scale and scope in the network. I then use this result to estimate the cost of providing four-wire loops, DS-1 loops and DS-3 loops. I respond below to Verizon's specific criticisms of my method of deriving these costs. AT&T and WorldCom also rely on Mr. Baranowski's restatement of Verizon's various cost studies to estimate the cost of providing other UNEs. Any assertion by Verizon that this is an inappropriate approach is undermined by the fact that Verizon uses multiple, disjointed models to estimate the cost of providing various UNEs.

B. The Synthesis Model Uses Valid Engineering Design Criteria

Q. VERIZON ALSO CONTENDS THAT THE SYNTHESIS MODEL DOES NOT CONFORM TO THE CARRIER SERVING AREA ("CSA") DESIGN CRITERIA AND DOES NOT CREATE A NETWORK CAPABLE OF PROVIDING ADVANCED SERVICES. DO YOU AGREE?

[Murphy @ 19]

A. Mr. Riolo's surrebuttal testimony deals with many of these issues, and I will not repeat them here. Mr. Murphy recommends that this Commission use a 12,000 maximum copper loop length. I will add two points to Mr. Riolo's testimony in response. First, even if Mr. Murphy's concerns were valid (and, as I discuss below, they are not), fewer than one percent of the loops constructed by the Synthesis Model for Verizon-VA exceed 12,000 feet.[30]

[30] This information, provided in the Model's output, identifies the distance from each drop terminal in the Synthesis Model back to the switch.

Second, Mr. Murphy's claim is merely an input issue and does not relate to the Synthesis Model platform. Although he bases his argument on the CSA standards, the FCC has already considered and rejected claims such as those posited by Mr. Murphy:

> We conclude that the federal mechanism should assume a maximum copper loop length of 18,000 feet. The record supports the finding that a platform that uses 18,000 foot loop-lengths will support at appropriate quality levels the services eligible for universal service support. Although BCPM has presented evidence that the provision of some, high-bandwidth advanced services may be impaired over 18,000-foot loops, we conclude that the BCPM sponsors have not presented credible evidence that the 18,000 foot limit will not provide service at an appropriate level, absent the use of expensive DLC line cards. We also disagree with BCPM's interpretation of the Bell Labs standards manual. The publication states, in pertinent part, that "[d]emands for sophisticated services are requiring the outside plant network to support services ranging from low-bit rate transmission to high-bit rates. To meet this demand, a digital subscriber carrier is being placed into the network starting at 12,000 feet from the serving [wire center]." The document is referring to the design of digital loop carrier systems and related outside plant that will "accommodate a wide range of transmission applications including voice, data, video, sensor control, and many others." This design standard seems to exceed the service quality standards for universal service. We find that the public interest would not be served by burdening the federal universal service support mechanism with the additional cost necessary to support a network that is capable of delivering very advanced services, to which only a small portion of customers currently subscribe. Accordingly, we conclude that the federal mechanism should assume a maximum copper loop length of 18,000 feet.
>
> *Platform Order*, at 70, footnotes deleted.

Here again, Mr. Murphy is simply rehashing arguments that have previously been rejected. In any event, his criticism shows that the Synthesis Model provides sufficient flexibility to allow the user to input any maximum copper loop length into the Model.

Q. VERIZON ASSERTS THAT THE NETWORK PRODUCED BY THE SYNTHESIS MODEL DOES NOT CONFORM TO "WIDELY-ACCEPTED" ENGINEERING STANDARDS BECAUSE IT DEPLOYS A RELATIVELY SMALL NUMBER OF CLUSTERS THAT REQUIRE RELATIVELY SHORT FEEDER SEGMENTS. IS THIS CRITICISM VALID?

[Murphy @ 24]

A. No. Mr. Murphy argues that it is more efficient to maximize the length of feeder segments because "[f]eeder facilities can be operated at higher utilization levels than distribution facilities...sound economic reasoning account[s] for this by maximizing the length of the feeder portion of loops and minimizing the length of the distribution portion." In the very next sentence, however, Mr. Murphy concedes that the changes he would recommend would *increase* cost. Thus, Mr. Murphy's own Rebuttal Testimony establishes that the Synthesis Model provides service more efficiently, which is fully consistent with TELRIC.

Furthermore, Mr. Murphy fails to offer any evidence on the appropriate average feeder length, but merely makes unsubstantiated assertions. Verizon's reported average feeder length is *** **Begin Proprietary** *** *** **End Proprietary** *** [31] while Verizon's own cost model produces average feeder lengths of *** **Begin Proprietary** *** feet*** **End Proprietary** *** [32] compared with the Synthesis Model's average feeder length of 11,647 feet (within ten percent of Verizon's model and four percent of Verizon's actual network). Given that feeder cable would be susceptible to inefficient routing in Verizon's network due to the piece-meal build-out of the embedded telephone network over time, the feeder length in the Synthesis Model is clearly reasonable.

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[31] This average feeder length was calculated from the LEADS AND LART Data in the file, LEIS0401.mdb, provided on CD #1 of Verizon's Direct workpapers. The "LEIS Data."

[32] Verizon's supporting cost studies for the two-wire basic unbundled loop. (See document 4.8)

Q. VERIZON ARGUES THAT THE SYNTHESIS MODEL BUILDS DISTRIBUTION AREAS THAT ARE LARGER THAN 600 LIVING UNITS AND, THUS "INEFFICIENT" AND "INAPPROPRIATE." DO YOU AGREE?

[Murphy @ 27-29]

A. Mr. Riolo addresses this criticism in his surrebuttal testimony. However, from a modeling perspective, this criticism is similar to Mr. Murphy's criticisms about the maximum copper loop length and average feeder lengths. The simple fact is that Verizon suggests use of an inefficient forward-looking construct that is at odds with the real-world engineering considerations that Mr. Riolo addresses in his testimony.

Again, Mr. Murphy's testimony is undermined by Verizon's own cost studies. Mr. Murphy acknowledges that most carrier serving areas in the Synthesis Model equate to a distribution area. However, Verizon data shows a similar number of carrier serving areas as the Synthesis Model estimates – 5,575 in the Synthesis Model compared with *** **Begin Proprietary** *** *** **END Proprietary** *** in Verizon's network..[33]

Thus, Mr. Murphy's argument validates the underlying clustering process used in the Synthesis Model. However, Mr. Murphy has not taken his analysis far enough. He has not 1) identified the number of collocated SAI/FDI's in Verizon's cost study or 2) identified the number of collocated SAI/FDI's in the Synthesis Model. In fact, Mr. Murphy is simply assuming that there is only one SAI/FDI at any given location in the Synthesis Model without *any* support for this premise.

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[33] Verizon's CSAs were also calculated using the "LEIS Data."

C. Verizon's Minimum Spanning Tree Criticism Shows a Lack of Understanding of the Synthesis Model

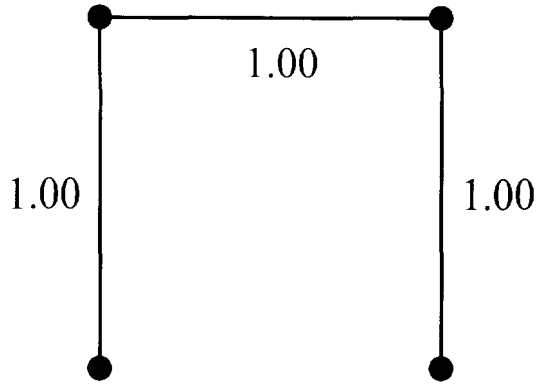
Q. IS VERIZON'S COMPARISON OF THE SYNTHESIS MODEL RESULTS TO THE MINIMUM SPANNING TREE, OR "MST" TEST ACCURATE?

[Tardiff @ 45]

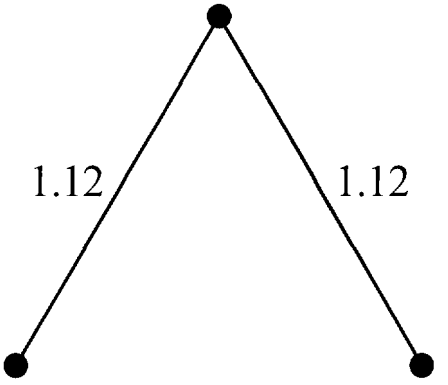
A. No. In what he calls an "external validity check," Dr. Tardiff compares the Synthesis Model to the results of an MST analysis. But Dr. Tardiff makes several mistakes that totally undercut his findings. The "corrected' analysis fully supports the distribution route distances produced by the Synthesis Model.

Q. AS A THRESHOLD MATTER, IS IT POSSIBLE FOR THE SYNTHESIS MODEL TO PRODUCE DISTANCES LESS THAN THE MST?

A. It is possible, because the premise of Dr. Tardiff's analysis, *i.e.*, that "[a]n MST is a mathematical graph theory construct used to connect a set of points at the least possible length of total connecting lines" is wrong. In fact, the MST is not the most efficient way to connect a set of points -- and the Synthesis Model employs a Steiner algorithm, not an MST. An MST finds the minimum distance of connecting *customer points* but fails to account for efficiencies in connecting customers at other locations. A simple diagram will help illustrate this problem. Consider the following two examples where a MST -- which does not factor into its algorithm any non-customer points -- would connect the customers as follows:

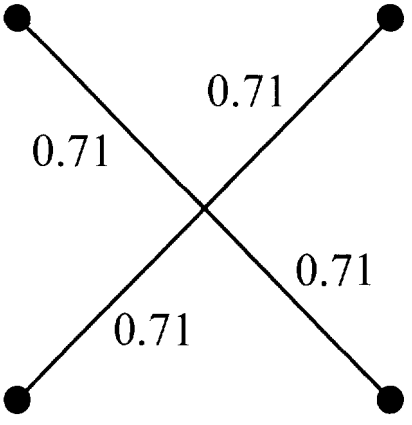


Total = 3.00

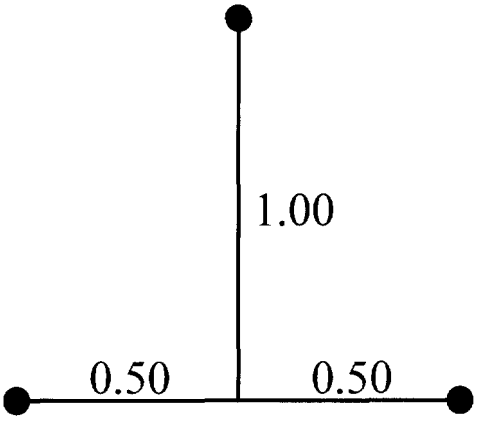


Total = 2.24

A Steiner algorithm *does* permit non-customer points of intersection. It would construct an efficient connection as follows:



Total = 2.83



Total = 2.00

In the examples above, the MST algorithm would result in approximately a six percent overstatement using the four customer example and a twelve percent overstatement using the three customer example.

Second, Dr. Tardiff's analysis inappropriately compares MST distances for two different sets of points. His analysis attempts to connect individual customer premises using an MST, but the distribution distances used in the Synthesis Model connect drop terminal locations using an MST.

Third, the Synthesis Model reports less distribution distance than is actually used to build the network. More specifically, the Synthesis Model correctly calculates investments based on the full distribution route distance, but mistakenly drops the distances associated with the primary SAI location in clusters with more than one SAI location.[34]

Fourth, Dr. Tardiff completely omits any citation to the portion of my testimony that describes the rationale for reducing the distribution road factor from 1.0 to 0.9 -- to reduce the distribution distance to account for excessive dispersion resulting from the surrogate customer location methodology.

Correcting Dr. Tardiff's analysis shows that the Synthesis Model results in conservatively high distances. Dr. Tardiff reports that the sum of the MST distances is 216,982,201 feet, and the Synthesis Model (after correcting the reporting error for distribution route distance) shows a total distribution distance of 255,773,540 feet. Backing out the adjustment for the excessive customer dispersion (which is amply supported in my Direct Testimony) yields a distance of 284,192,822 feet -- 1.31 times the MST distance reported by Dr. Tardiff, and within the reasonable range that Mr. Murphy indicated is

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[34] A more thorough analysis of the clusters where this situation occurs would have led Dr. Tardiff to this same conclusion, *i.e.*, that the incorrect distance was being reported while the reported investment was correct. Dr. Tardiff could have tested this, as I did, by evaluating the average cost per foot of the distribution plant for that density zone and comparing it with the input cost per foot.

appropriate.[35] After adding drop lengths into this analysis, which is necessary to connect the drop terminals to the customer locations in Dr. Tardiff'S MST analysis, the Synthesis Model distance is 443,272,949, or twice Dr. Tardiff's MST distance and well above the high end of what he would expect the Model to produce.

Q. WHAT DOES DR. TARDIFF'S VALIDATION TEST SHOW WITH RESPECT TO VERIZON'S LOOP MODEL?

A. This analysis cannot be performed on Verizon's models because they do not contain information for all loops. Verizon's model is based on a simple, outdated sample of loops within distribution areas. Therefore, Verizon's model lacks the sophistication and detail to permit any such analysis, and it is impossible to validate Verizon's model as Dr. Tardiff asserts is necessary.

D. Verizon's Testimony Validates the Drop Length Results of the Synthesis Model

Q. VERIZON ASSERTS THAT THE DROP LENGTHS RESULTING FROM THE SYNTHESIS MODEL ARE UNREALISTICALLY LOW. IS THIS CORRECT?

[Murphy at 46, 104-107]

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[35] It is appropriate to back out by .9 road factor adjustment to create an apples-to-apples comparison with Dr. Tardiff's MST analysis, which is performed on the set of Synthesis Model customer locations that I believe is too widely dispersed.

A. No. Mr. Murphy's analysis is implemented incorrectly and leads him to an incorrect conclusion. Once again, when his analysis is corrected, his benchmarks serve to validate the results of the Synthesis Model.

Q. WHAT DOES VERIZON CITE AS REASONABLE DROP LENGTH ESTIMATES?

A. Mr. Murphy cites to HAI Model documentation that identifies the average drop length as 73 feet, based on a nationwide study. (*See* Murphy at 105)

Q. WHAT DOES VERIZON CONCLUDE ABOUT DROP LENGTHS IN THE SYNTHESIS MODEL?

A. Mr. Murphy concludes that the Synthesis Model produces "a ridiculously low drop length." (*see* Murphy at 105) However, this conclusion is based on a faulty analysis. Mr. Murphy erroneously divides the total drop length produced by the Synthesis Model by the number of lines rather than by the number of drops. If he had performed his analysis correctly, he would have divided the total drop length by the number of customer locations used by the Synthesis Model to construct plant. Had he done so, he would have calculated an average drop length of 77.4 feet, slightly more than the value he cites as an appropriate standard.

E. The Synthesis Model Does Not Ignore Vacant Residence and Business Units as Verizon Suggests

Q. MR. MURPHY CLAIMS THAT THE SYNTHESIS MODEL UNDER-BUILDS DISTRIBUTION FACILITIES BY IGNORING VACANT RESIDENCE AND BUSINESS UNITS. DO YOU AGREE?

[Murphy at 23-25]

A. On this issue, Mr. Murphy is raising arguments that have already been considered and rejected by the Commission:

> To the extent that the PNR methodology includes the cost of providing service to all currently served households, we conclude that this is consistent with a forward-looking cost model, which is designed to estimate the cost of serving current demand. As noted by AT&T and MCI, adopting housing units as the standard would inflate the cost per line by using the highest possible numerator (all occupied and unoccupied housing units) and dividing by the lowest possible denominator (the number of customers with telephones).
>
> *Inputs Order,* at *57.*

State commissions also have considered and rejected similar ILEC arguments. For example, the New Mexico State Commission considered whether to include vacant housing units and determined that LECs should not include unoccupied houses in their cost studies:

> It is rational and cost efficient for a local exchange carrier to install plant to meet not only today's level of demand, but also anticipated growth. For this reason BCPM does not assume that the fill rate for its distribution and feeder facilities is 100%. Rather, the model uses a lower level of utilization in order to insure that facilities are available for future growth. Additional spare is included in the model due to the fact that cables are only available in discrete sizes.[36] Consequently, the need to provide sufficient capacity for new line additions is accounted for elsewhere in the model. As a result, the use of housing units, rather than households, results in a cost estimate that reflects the

[36] Even if the utilization value for distribution plant is set at 100% within BCPM, there are spare facilities. The model assumes that two pairs are installed per housing unit. (14 Tr. 17.)

> assumption that plant is built in areas where no one lives and for which the local exchange company has not constructed facilities.
>
> Paradoxically, U.S. WEST contends that when estimating the cost of an unbundled loop, it is appropriate "to model a network to current customers, since that is the source of the carrier's actual cost data." (U.S. WEST Proposed Findings 229.) BCPM, by contrast, includes in its estimate the cost of serving areas where LECs do not provide service.
>
> The Commission finds that providing support for areas in which local exchange carriers incur no costs would undermine the preservation and advancement of universal service. The purpose of the universal service fund is to provide support to "[c]onsumers in all regions of the Nation, including low-income consumers and those in rural, insular, and high cost areas." 47 U.S.C. §254(b)(3). *Nothing in the Act indicates that Congress intended LECs to receive support for housing units in unoccupied areas.*[37]

The staff of the Louisiana Public Service Commission reached a similar conclusion:

> Another difference between the Hatfield model and the BCPM is the number of housing units to which each model builds. The BCPM builds to all housing units regardless of whether or not they are occupied or currently have phone service. The basis for this design in the model is the contention that being the carrier of last resort the BCPM must stand ready to serve. The Hatfield model builds only to current customers.
>
> Staff does not agree that the universal service support should include the cost of possibly serving customers that currently do not have service, above and beyond that which is already included in the model through fill factors. BellSouth provided no evidence of ever reaching 100% penetration of local telephone service or that all unoccupied houses would be occupied in the future. Staff believes that the implied assumption that universal service funding should include the cost to serve the entire population is without merit and would overcompensate BellSouth for its universal service obligation.[38]

Additionally, Mr. Murphy ignores the fact that the Synthesis Model customer location database actually includes customer locations that were vacant at the time of the Census. The Synthesis Model's customer locations are based, in part, on a database that contains addresses used for mass mailings. Mr. Murphy attempts to misdirect the Commission as to the nature of his criticism by asserting that it is unlikely that the mass mailings went to

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[37] Docket Nos. 96-310-TC, *In the Matter of the Consideration of the Adoption of a Rule Couching Costing Methodologies, and 96-334-Tc, In the Matter of the Implementation of New Rules Related to the Rural, High Cost, and Low Income Components of the New Mexico Universal Service Fund*, July 1998, paras. 161-63.

[38] *Staff's Final Recommendation concerning the Louisiana Public Service Commission's Cost Study Submission to the Federal Communications Commission for Federal Universal Service Support*, at page 16.

vacant lots.[39] The fact is that the Synthesis Model customer location database includes houses that are vacant due to rental turnover or real estate transfer, particularly when the space was previously occupied because the customer location data relies on the greater of two different approaches. This approach, combined with the previously discussed use of fill factors of less than 100%, provide for significant customer turnover, churn, and future growth.

F. The Synthesis Model Correctly Accounts for Economies of Scale and Scope

Q. VERIZON IS CRITICAL OF YOUR FORECAST OF SPECIAL ACCESS LINES. HOW DO YOU RESPOND?

[Murphy @ 29-31]

A. I was unaware that Verizon-VA changed its reporting methodology for special access lines in the year 2000. I intended to quantify the real historical growth that Verizon-VA observed and simply trend that growth forward. Accordingly, I have revised my line counts based on the growth of special access lines (which I discuss later in my testimony).

Q. DO YOU AGREE WITH VERIZON'S CRITICISM THAT THE LINE COUNTS EMPLOYED IN THE MODEL, *I.E.*, USE OF DS-0 EQUIVALENTS FOR DS-1S, CREATE PROBLEMS IN THE MODELING PROCESS?

[Murphy @ 31-37]

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[39] It is unlikely that these mass mailings were delivered to vacant lots. It is equally unlikely that telephone calls are made to vacant lots, or that phone service is pre-installed to vacant lots.

A. No, I do not. First, it is important to understand that there has been a long-standing dispute between ILECs and CLECs concerning whether to use DS-0 equivalents or physical line counts in modeling the local exchange network, and the FCC was well aware of these disputes as it developed the Synthesis Model.[40] Mr. Murphy contends that use of DS-0 equivalents distorts two aspects of the calculations in the Synthesis Model, *i.e.*, (1) how much plant is constructed, and (2) how overall annual costs of constructing and operating a forward-looking network are assigned to individual lines. In addition, he argues that I have failed to account for the electronics required by DS-1 and DS-3 services. I discuss each of these claims below.

Q. DO YOU AGREE WITH MR. MURPHY'S CLAIM THAT IT IS WRONG TO USE DS-0 EQUIVALENTS AS THE DIVISOR IN CALCULATING THE OVERALL COST PER LINE OF CONSTRUCTING AND OPERATING THE NETWORK?

A. No. First, it is important to keep in mind that the ARMIS data reported by Verizon appears to reflect only DS-1 services and not DS-3 services. Thus, the approach is quite conservative. With that background, this argument is largely about how significant amounts of investment common to POTS and special access services should be allocated between users of POTS and other customers of the modeled network. Mr. Murphy's claim (at 36) that my approach results in "a significant dilution of OSP costs" is based on his view that use of DS-0 equivalents allocates more common costs (such as structure costs) to special access services. As I describe below, I have consistently used the cost

[40] For example, the FCC recognized that channel equivalents were inputs to the original Synthesis Model and explicitly adjusted these channel equivalents in deriving the number of copper pairs for estimating cable sizes.

per DS-0 equivalent, produced by the Synthesis Model, as the basis for calculating cost associated with DS-1 loops. Thus, there is no error introduced by using DS-0 equivalents as the divisor in calculating the overall cost per line. The total cost of the loop plant is spread over the different types of loops, using a reasonable method of allocation.

Q. DID THE FCC DELIBERATELY CHOOSE TO USE SPECIAL ACCESS LINES REPORTED ON A DS0 EQUIVALENT BASIS?

A. Yes, in the Tenth Report and Order, the FCC reviewed these same criticisms and concluded that line counts should reflect DS-0 equivalents in the Synthesis Model. Specifically, the FCC confirmed the use of special access lines in the underlying line counts and also developed inputs associated with the deployment of digital lines in the distribution plant. [41] As I will describe later, the FCC also specifically reaffirmed the use of DS0 equivalents with respect to the development of common support overhead expenses on a per line basis.

Q. WHAT IS THE MOST CRITICAL ISSUE RELATIVE TO CHANNEL EQUIVALENTS?

A. The most critical issue is that this Commission apply a consistent standard for both USF calculations and UNE calculations. In the past, ILECs have argued *for* use of DS-0 equivalents in a UNE docket relating to loop costs while using physical pairs in USF proceedings, thus using inconsistent approaches that tend to distort costs. These

[41] *Inputs Order* at 99-100.

inconsistencies, if allowed to occur, will result in both overstated universal service funding requirements and excessive UNE prices for the more advanced services. It is critical that this Commission treat this issue consistently.

Q. IS YOUR PROPOSED TREATMENT OF LINE COUNTS REPORTED ON A DS-0 EQUIVALENT BASIS APPROPRIATE?

A. Yes. First, it is consistent with what approach the FCC has determined is appropriate for reflecting the economies of scale and scope in the local network. Second, Mr. Murphy fails to consider that the total fiber structure investment needed to provide all of these facilities is included in the Synthesis Model outputs. Clearly, it would be inappropriate to allocate all of these fiber and structure costs solely to copper-based platforms. The FCC's methodology appropriately attributes a portion of these costs to higher-bandwidth services in a similar fashion to the way in which Verizon's model associates fiber costs with the capacity of each service. (*See* Baranowski surrebuttal at p. 6-8)

This is precisely why it is imperative that this Commission use a consistent methodology for all services so that ILECs cannot artificially inflate the cost of copper lines by assigning the structure costs by physical pairs or artificially inflate the cost of fiber lines by assigning the structure costs on a DS0 equivalent basis. The methodology I have used in estimating the cost of DS-1 and DS-3 services is fully consistent throughout its application.

If this Commission determines that structure costs should be estimated solely on a physical pair/strand basis, then this Commission must substantially decrease the costs of

the DS-1 and DS-3 UNEs I have presented here and also adjust all of Verizon's models to develop structure costs on a per-strand basis instead of a per-DS0 basis. In other words, if this Commission determines that structure should be assigned on a per-service basis, then the per-foot structure cost of a DS-3 should be the same (or very similar) to the per-foot structure cost of a DS-0. However, this is not currently the case.

As Mr. Baranowski shows in Table 1, Verizon's cost studies currently estimate *** **Begin Proprietary** *** *** **End Proprietary** *** of total fiber per DS-3 service with an average length of *** **Begin Proprietary** *** *** **End Proprietary** *** feet, for an average of *** **Begin Proprietary** *** *** **End Proprietary** *** of fiber per foot. On the other hand, Verizon's cost studies currently estimate *** **Begin Proprietary** *** *** **End Proprietary** *** of total fiber per DS-0 service with an average length of *** **Begin Proprietary** *** *** **End Proprietary** *** feet, for an average of *** **Begin Proprietary** *** *** **End Proprietary** *** of fiber per foot. Clearly, Verizon is associating fiber (and thus, structure and DLC) with the capacity of the service, resulting in 624 times the fiber cost per DS-3 service than per DS-0 service. (See Baranowski at 7)

In the end, the Synthesis Model places all of the fiber and structure necessary to provide all of the services included in the model. It is completely inappropriate to associate all of the structure on a per-service or per-pair basis and then artificially inflate the higher-bandwidth services, thereby allowing Verizon to reap a windfall.

Given the above facts, I am perplexed why Verizon is criticizing the FCC for adopting the use of DS-0s to capture the economies of scale and scope and associated costs with the services that use the facilities.

Q. IF YOU WERE TO CONSTRUCT THE MODEL ON A PHYSICAL PAIR BASIS, WHAT TYPES OF ADJUSTMENTS WOULD BE NECESSARY?

A. In constructing the network on a physical pair basis, one would have to include the entire demand of the network, account for the full scope of structure sharing between services that exist and attribute the costs to all services. For example, one might associate one-half of all structure to fiber-fed services in areas with one copper cable and one fiber cable. Alternatively, all fiber and DLC might well be allocated on a capacity basis.

Since Verizon-VA did not provide me with a complete set of special access line data on a physical pair basis, I have been unable to go beyond a largely conceptual analysis of this approach.[42]

G. My Cost Proposals Appropriately and Consistently Apply TELRIC Principles to Estimating the Cost of All UNEs Based on the Synthesis Model

Q. VERIZON CLAIMS THAT YOU HAVE FAILED TO ACCOUNT AT ALL FOR THE COST OF THE ELECTRONICS REQUIRED TO PROVISION DS-1 AND DS-3 SERVICES. IS THIS TRUE?

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[42] Verizon-VA indicated that it would be unduly burdensome and require a special study to provide us with the special access lines on a physical pair basis. [See AT&T 4-4]

[Murphy @ 37-38]

A. Absolutely not. Mr. Murphy's criticism fails to recognize that the costs developed by the Synthesis Model for DS-0 equivalents include the DS-0 line cards on the DLC. As I explained in my Direct Testimony, I developed UNE estimates for DS-1 and DS-3 costs by starting with the UNE cost per DS-0, *including* the costs associated with the DS-0 slots on the DLC. Using these costs as a starting point more than offsets the DS-1/DS-3 electronics required to provide these services. Thus, the ratio I used to estimate the cost of a DS-1 includes over four times the line card costs of a POTS line. In other words, I conservatively estimated that a DS-1 line card would cost $322.5 (assuming a $75 average cost line card, which is much more conservative than an actual DS-1 line card cost of *** **Begin Proprietary** *** *** **End Proprietary** *** provided to us by Verizon in response to an AT&T/WorldCom data request.

Q. VERIZON IS CRITICAL OF THE WAY IN WHICH YOU DEVELOPED COSTS FOR FOUR-WIRE, DS-1 AND DS-3 LOOPS. HOW DO YOU RESPOND?

[Murphy @ 38-46]

A. Mr. Murphy's first objection seems to be that I started with a two-wire TELRIC cost that he believes is understated. For all the reasons I have previously articulated, my two-wire TELRIC is accurate and, therefore, an appropriate starting point.

Second, with respect to the four-wire loop cost I developed, he argues that I failed to take into account that two-wire loops use a concentration capability under GR-303 that is not available for use with four-wire loops. As a result, he argues, DLC costs need to be

increased by a factor of four. Mr. Murphy is simply wrong. He has failed to analyze the algorithms of the Synthesis Model, which do not include any concentration in DLC equipment. This lack of concentration leads to conservatively high costs and undercuts Mr. Murphy's criticism.

Third, he argues that my four-wire calculations failed to take into account the fact that a four-wire loop makes less-efficient use of the plug-in shelf slot in the DLC cabinet. Mr. Riolo addresses this point in his testimony.

Fourth, Mr. Murphy asserts that I have included in sufficient additional NID cost in the four-wire loop calculation. Again, he is wrong. As can be easily seen in the costs proposed by Verizion for the 2-wire and 4-wire NID UNEs, there is only a $0.07 difference between 4-wire and 2-wire NID.[43]

With respect to the DS-1 and DS-3 costs that I developed, Mr. Murphy does not appear to object to the 9.6 ratio of DS-3-to-DS-1 cost that I utilized, or to the 4.3 ratio of DS-1-to-DS-0 cost I utilized although he does complain that they "ignore the DS-0 equivalent demand used in the Synthesis Model based on 12 DS-0 equivalents." Again, Mr. Murphy is incorrect. Instead, we have used a relationship of physical lines to DS-0 equivalents based on publicly-available information.

Moreover, Verizon's own studies support the relationship of DS-0 costs to DS-1 and DS-3 costs. Verizon's studies estimate that DS-1 loop costs approximately 5.66 times the

[43] See Verizon's Summary of Costs filed on direct.

cost of a DS-0 loop compared with our estimate of 4.3. For DS-3s, Verizon estimates that a DS-3 loop costs approximately 9.87 times the cost of a DS-1 loop, compared with our estimate of 9.6.[44] Thus, it is not surprising that Verizon does not focus on these relationships – because they are validated by their own models.[45]

H. The Synthesis Model Correctly Uses the Appropriate Engineering Criteria for Designing Switching and Interoffice Facilities

Q. HOW DO YOU RESPOND TO THE CRITICISMS REGARDING THE SYNTHESIS MODEL SWITCHING CALCULATIONS?

[Murphy @ 47-50]

A. Ms. Pitts addresses Verizon's criticisms regarding the Synthesis Model switching module and input values.

Q. HOW DO YOU RESPOND TO THE CRITICISMS REGARDING THE SYNTHESIS MODEL TRUNKING CALCULATIONS?

[Murphy @ 47-50]

A. Mr. Turner addresses Verizon's criticisms regarding the Synthesis Model interoffice module and input values.

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[44] See Attachment 1 to AT&T/WorldCom's Rebuttal Recurring Panel Testimony.
[45] See Verizon's own Summary of Costs (Statewide).